



DIFFICULT AIRWAY MANAGEMENT

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The airway we hope for..



The Airways we get...



...






Goals and Objectives

- Gain an understanding of how to evaluate the airway
- Review predictors of difficult intubation
- When to RSI
- Surgical airway review
- Overview of rescue devices and techniques
- Non-invasive adjuncts
- Pediatric Issues



Primary Survey

- *A*irway Maintenance with C-spine control
 - *B*reathing
 - *C*irculation
 - *D*isability
 - *E*xposure
- 

Airway with Cervical Spine Control

- Rapid assessment of airway patency
 - Includes inspection for foreign bodies and maxillofacial fractures that may result in obstruction
 - Chin-lift & jaw thrust or nasal/oral airway insertion
 - In-line cervical immobilization
 - GCS determination

Decision to Intubate


- Failure to protect the airway
 - Gag reflex absent in 25% of normal adults
 - More reliable indicator is patients ability to swallow or handle secretions,phonate and level of consciousness
 - GCS < 8

Decision to Intubate

- Failure of Ventilation or Oxygenation
 - Hypoxemia or ventilatory failure not reversible by clinical means mandates intubation
 - Clinical assessment (pt status, O₂ sats, and ventilatory pattern)
 - ABGs not helpful, rarely indicated, and can be misleading




Decision to Intubate

- Anticipated clinical course
 - Is there a reasonable likelihood the pt will require intubation?
 - Significant multi-system trauma alone may be an indication for intubation.
 - Is there a need for painful or invasive procedures or studies outside of the ED?
 - Penetrating neck trauma with any evidence of vascular or direct airway injury.
- 



Identification of the Difficult Airway

- Intubation usually easy and straightforward
 - Failure rate < 3% in trauma pts
 - BVM difficult in 1/3 of pts in whom intubation fails
 - Paralytics should be avoided in pts in whom a high degree of intubation difficulty is predicted
- 



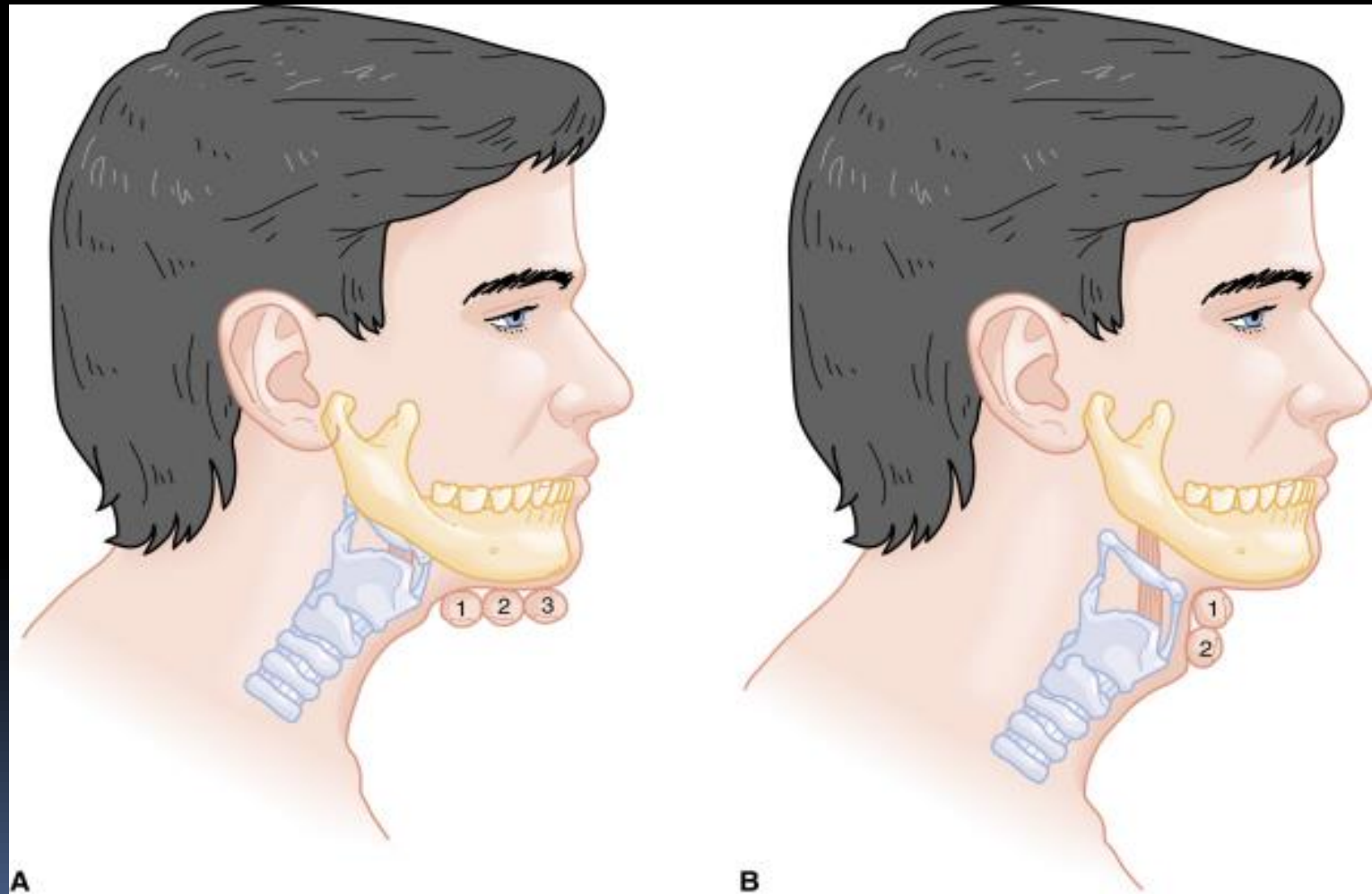
LEMON Law

- *Look* externally for signs of difficult intubation(gestalt), difficult BVM, and difficult cricothyrotomy
- *Evaluate* 3-3-2 rule
- *Mallampati*
- *Obstruction*
- *Neck Mobility*

Predictors of Difficult BVM

- *Mask seal*
- *Obesity*
- *Aged*
- *No teeth* - “remove dentures to intubate, leave them in to bag/mask ventilate”
- *Stiffness*

3-3-2



Mallampati Classification



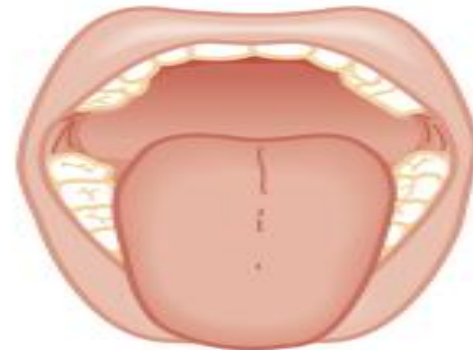
Class I: soft palate, uvula, fauces, pillars visible
No difficulty



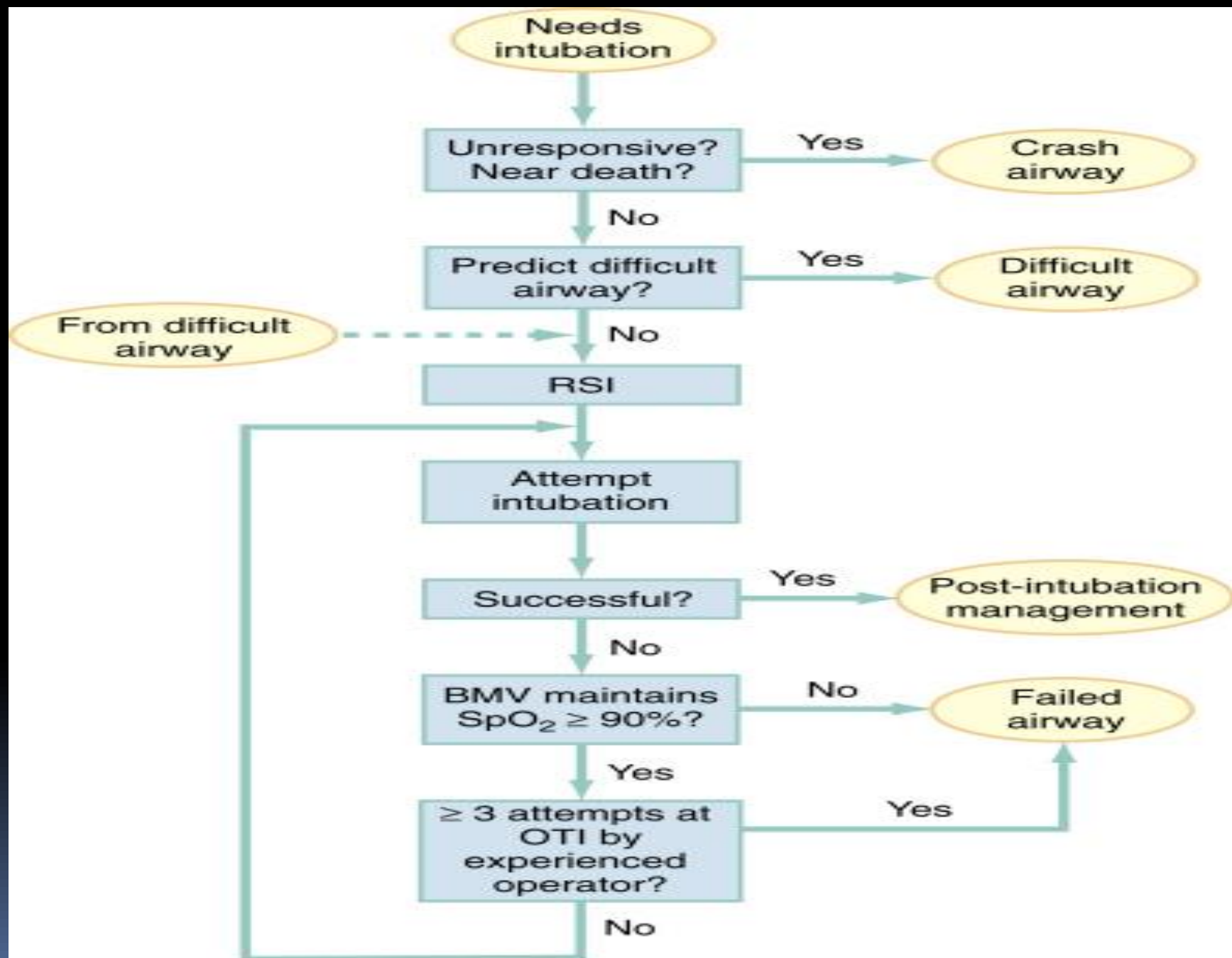
Class II: soft palate, uvula, fauces visible
No difficulty



Class III: soft palate, base of uvula visible
Moderate difficulty



Class IV: hard palate only visible
Severe difficulty



Crash airway

BMV

Attempt oral
intubation

Successful?

Yes

Post-intubation
management

No

BMV
successful?

No

Failed
airway

Yes

Succinylcholine
2.0 mg/kg IVP

Repeat attempt
at oral intubation

Successful?

Yes

Post-intubation
management

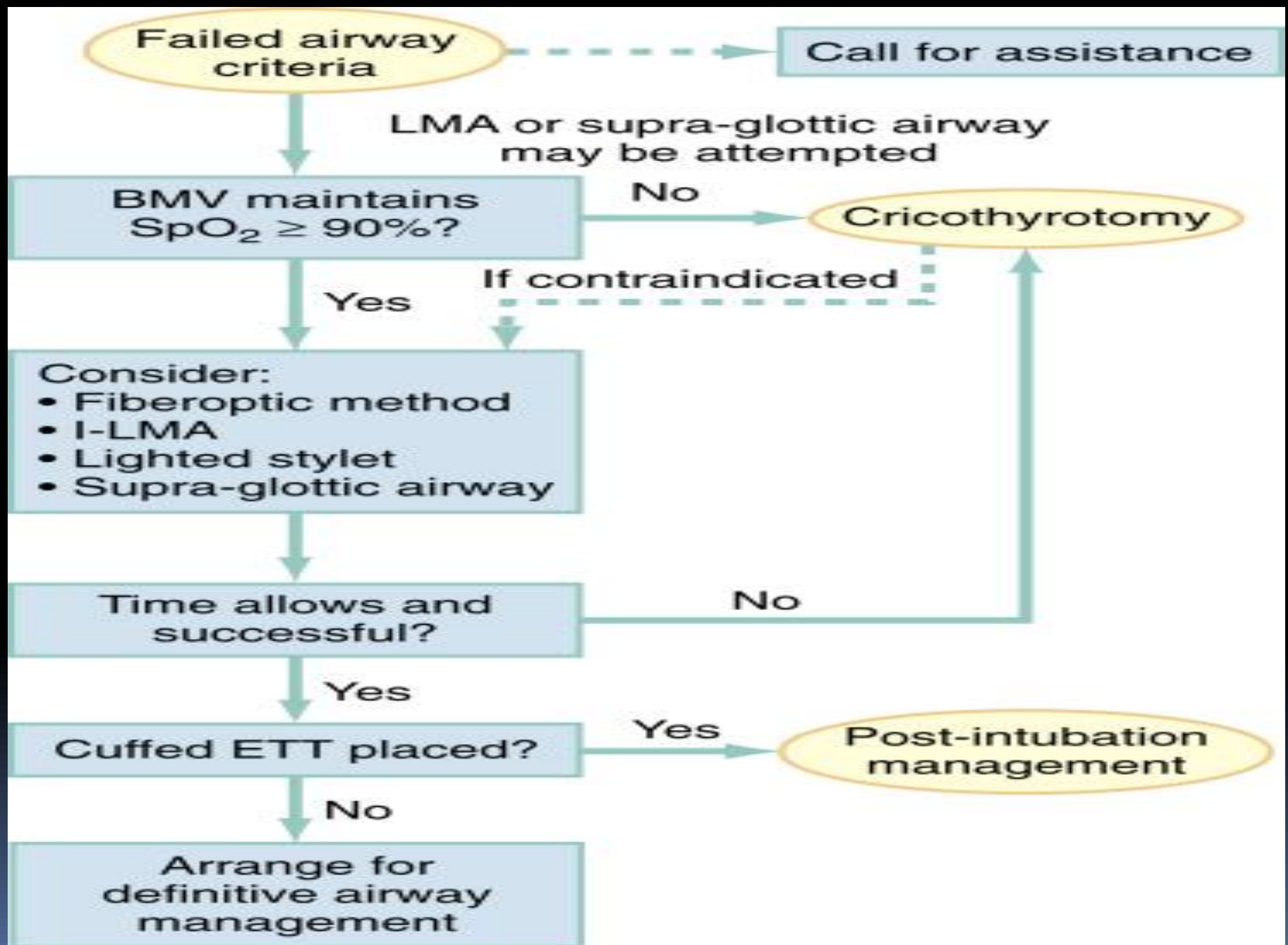
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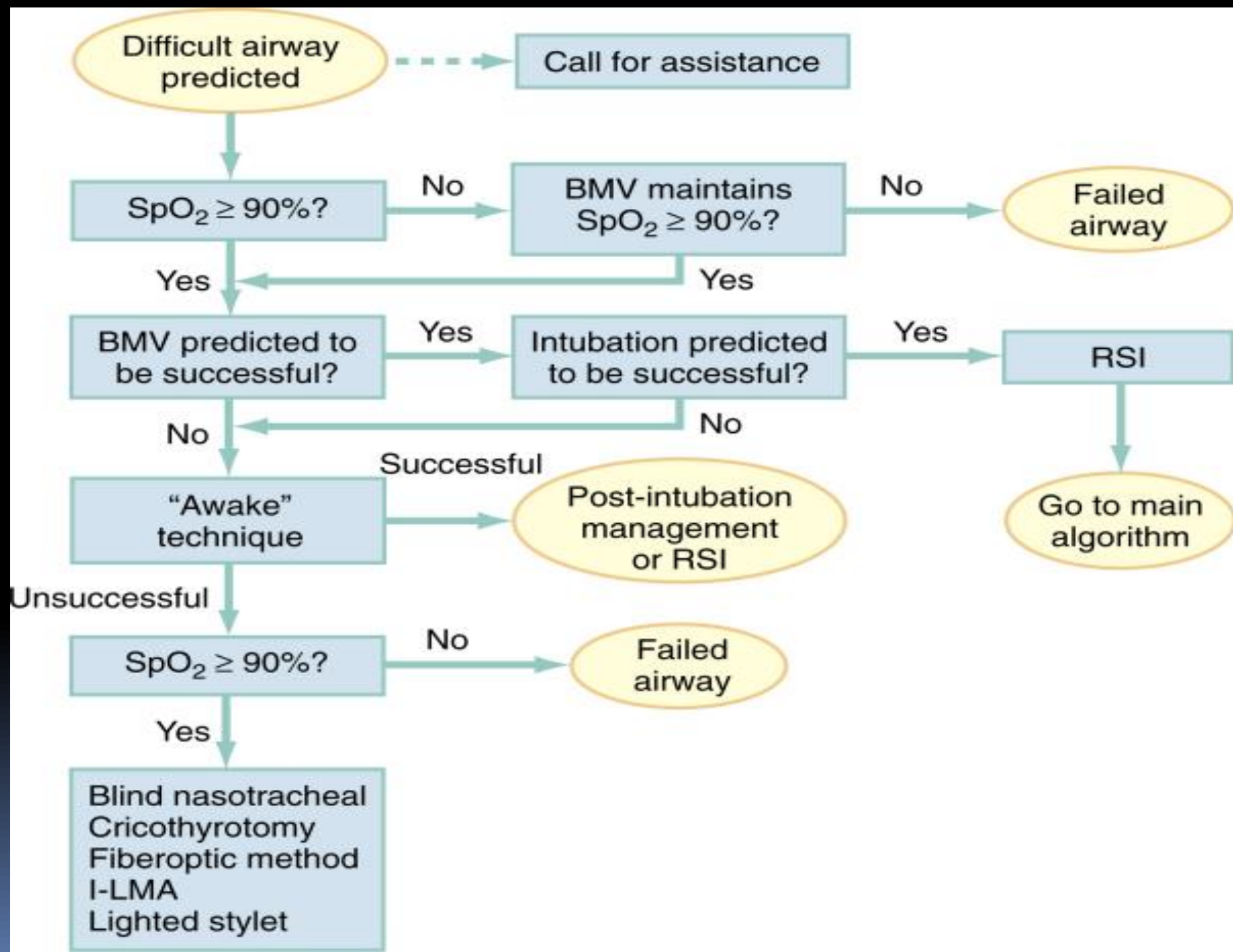
≥ 3 attempts by
experienced
operator?

Yes

Failed
airway

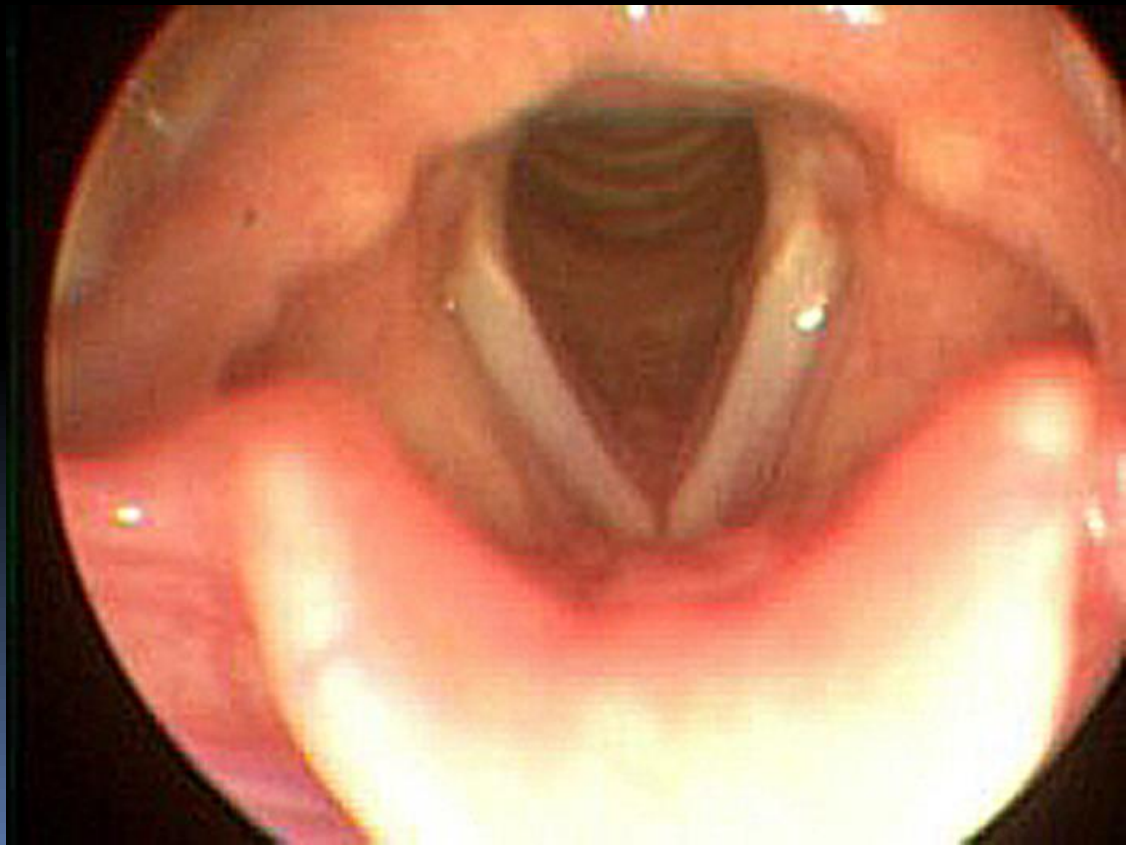
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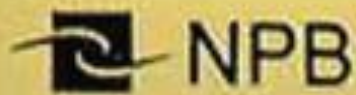




ET Tube Confirmation

- Visualization of tube passing through cords
- End-tidal CO₂
- Auscultation
- CXR





NPB

Easy Cap II CO₂ Detector

CHECK

5.0

C

2.0

< 2.0

B


0.5

A

< 0.5 >

0.03



 NPB

Easy Cap II CO₂ Detector
CHECK

5.0

C

2.0

< 2.0

B

0.5

0.03

A

< 0.5 >





Rapid Sequence Intubation


- RSI is the cornerstone of modern airway management
- Defined by virtually simultaneous administration of a potent sedative agent and a neuromuscular blocking agent

Rapid Sequence Intubation

- “Goal is to take the pt from consciousness and breathing spontaneously to a state of unconsciousness with complete neuromuscular paralysis, then to achieve intubation WITHOUT interposed positive-pressure ventilation.”




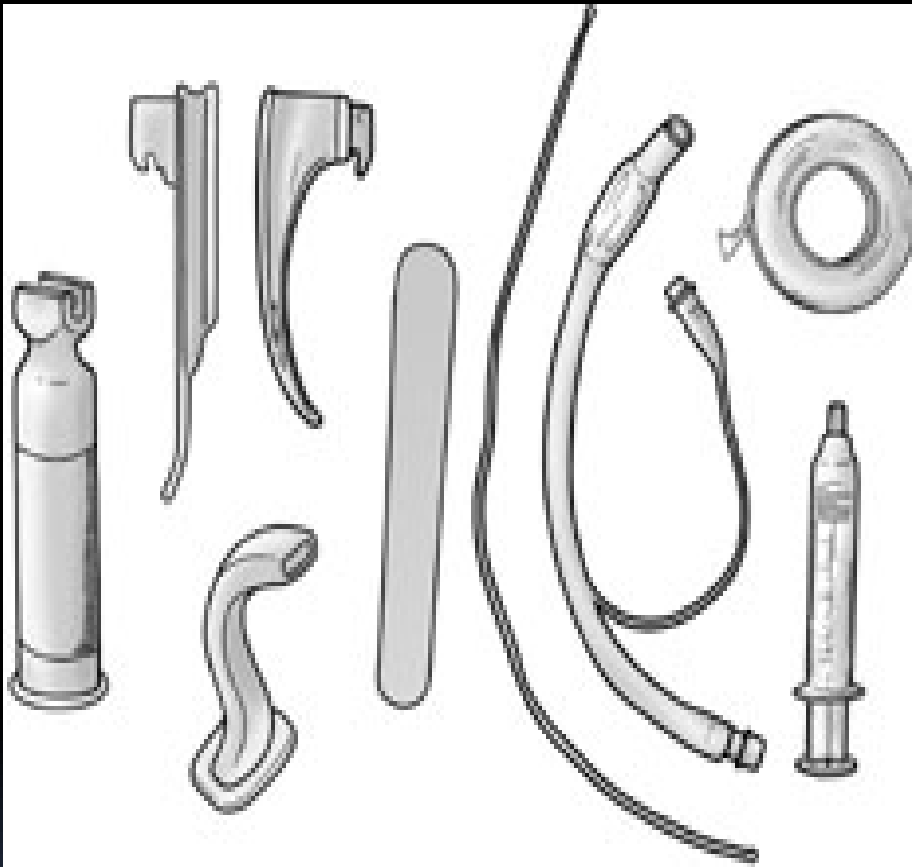
SIX “Ps” of RSI

- Preparation
 - Preoxygenation
 - Pretreatment
 - Paralysis with induction
 - Placement of tube
 - Post-intubation management
- 



Preparation

- Assess for intubation difficulty
 - Drugs
 - Equipment
 - Safety net
- 



Eschmann Bougie

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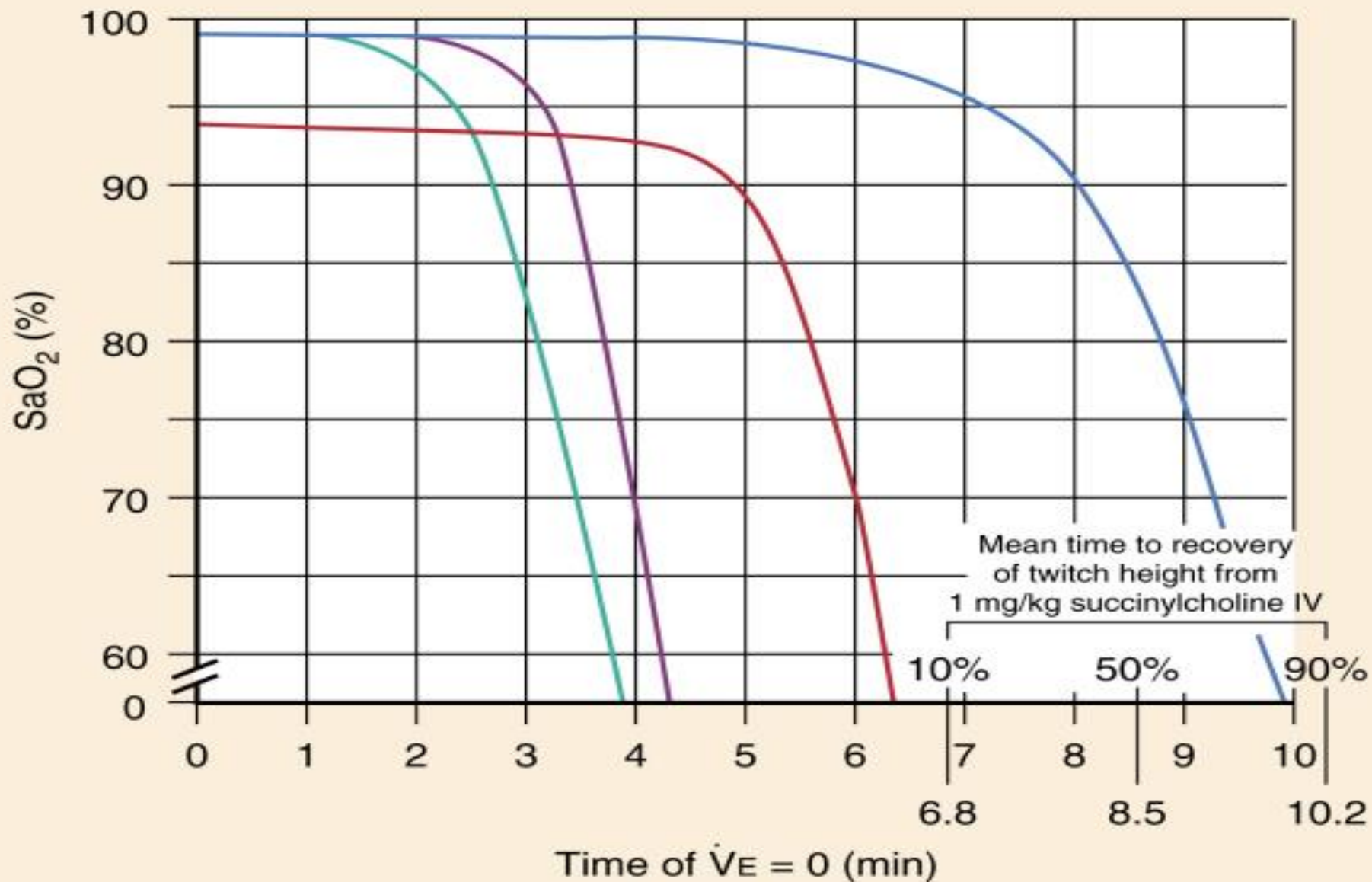
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Preoxygenation

- Administration of 100% for 3 min of normal tidal volume breathing
- Permits 8 min of apnea in a healthy adults
- If insufficient time is available, 8 vital capacity breaths with high flow O₂ is acceptable



— Obese 127-kg adult

— Normal 70-kg adult

— Normal 10-kg child

— Moderately ill 70-kg adult

Pretreatment

- Drugs are administered 3 minutes before admin of succinylcholine to mitigate the effects of laryngoscopy and intubation
- Intubation results in sympathetic discharge, ↑ ICP, bronchospasm and bradycardia in children.

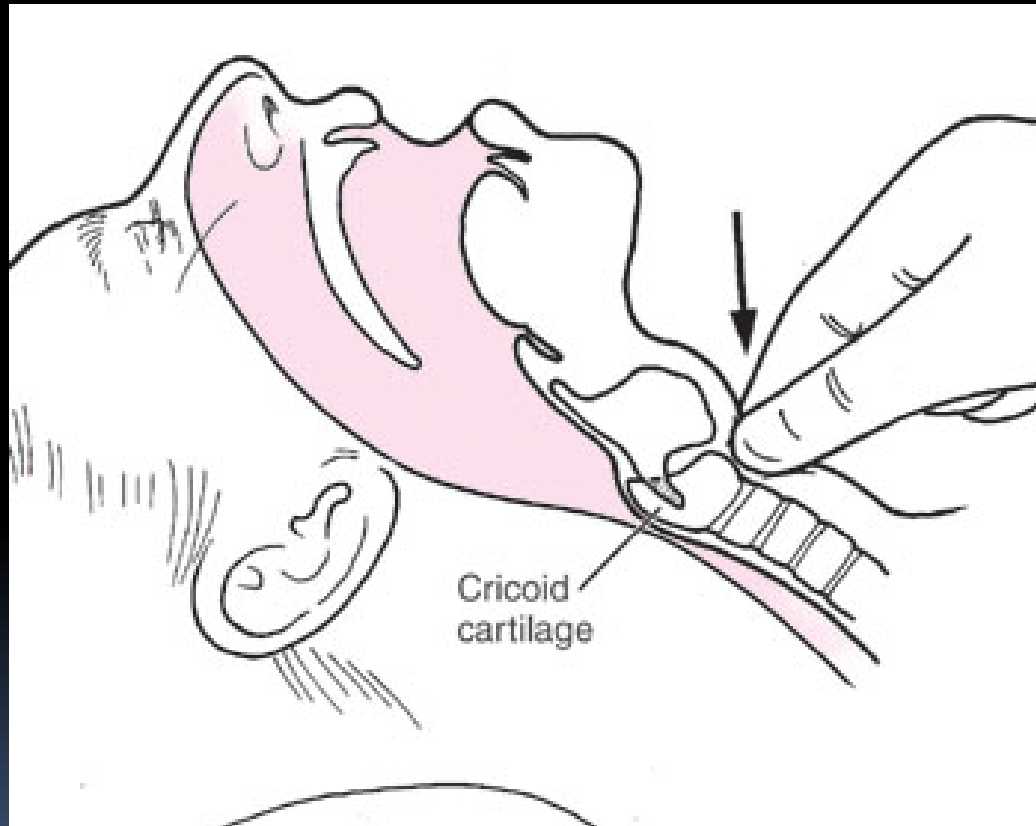
Pretreatment Agents for RSI

- *Lidocaine*
- *Opioid*
- *Atropine*
- *Defasciculation*

Paralysis With Induction

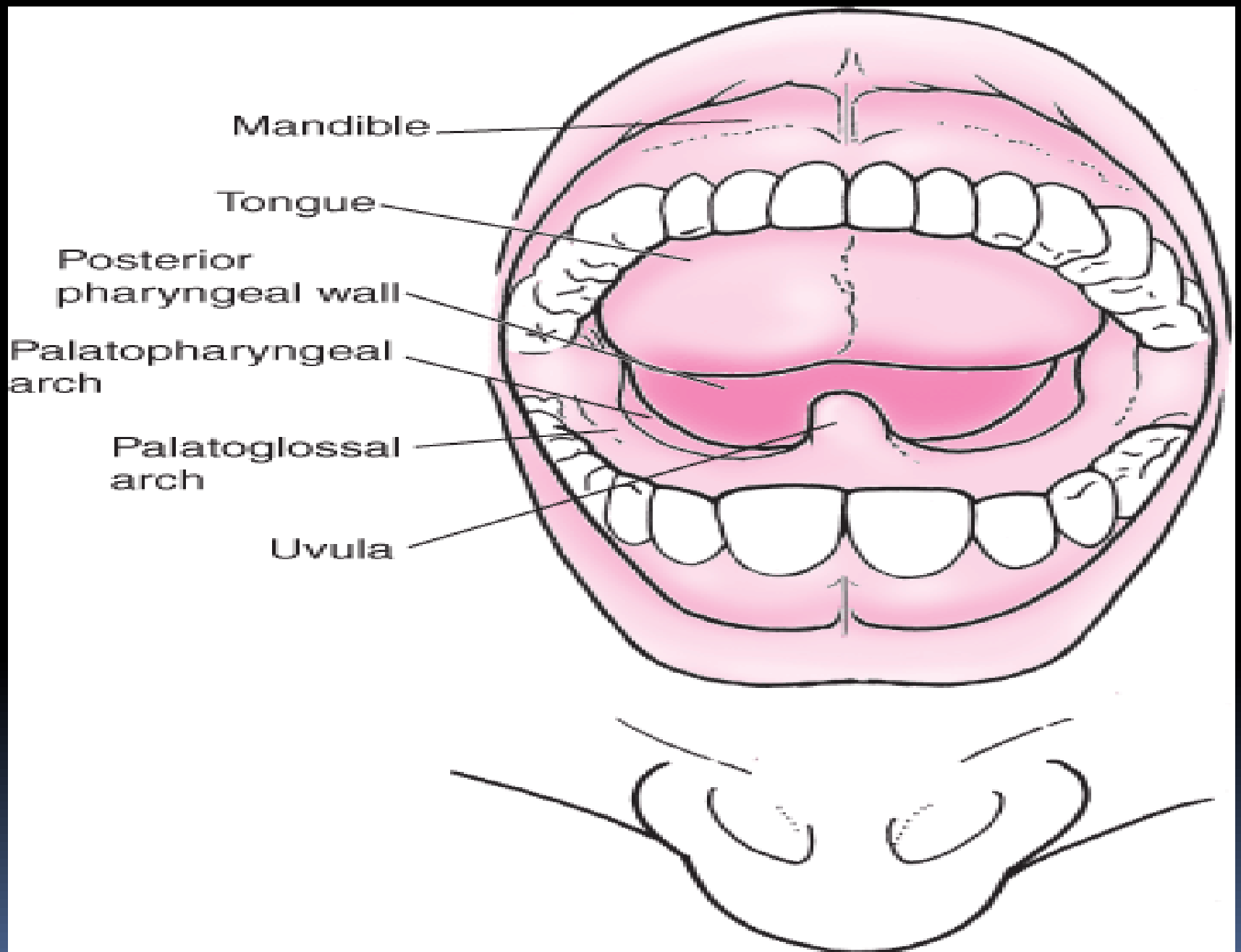
- Etomidate (0.3 mg/kg)
- Succinylcholine (1.5 mg/kg)
- Sellick's manueuver

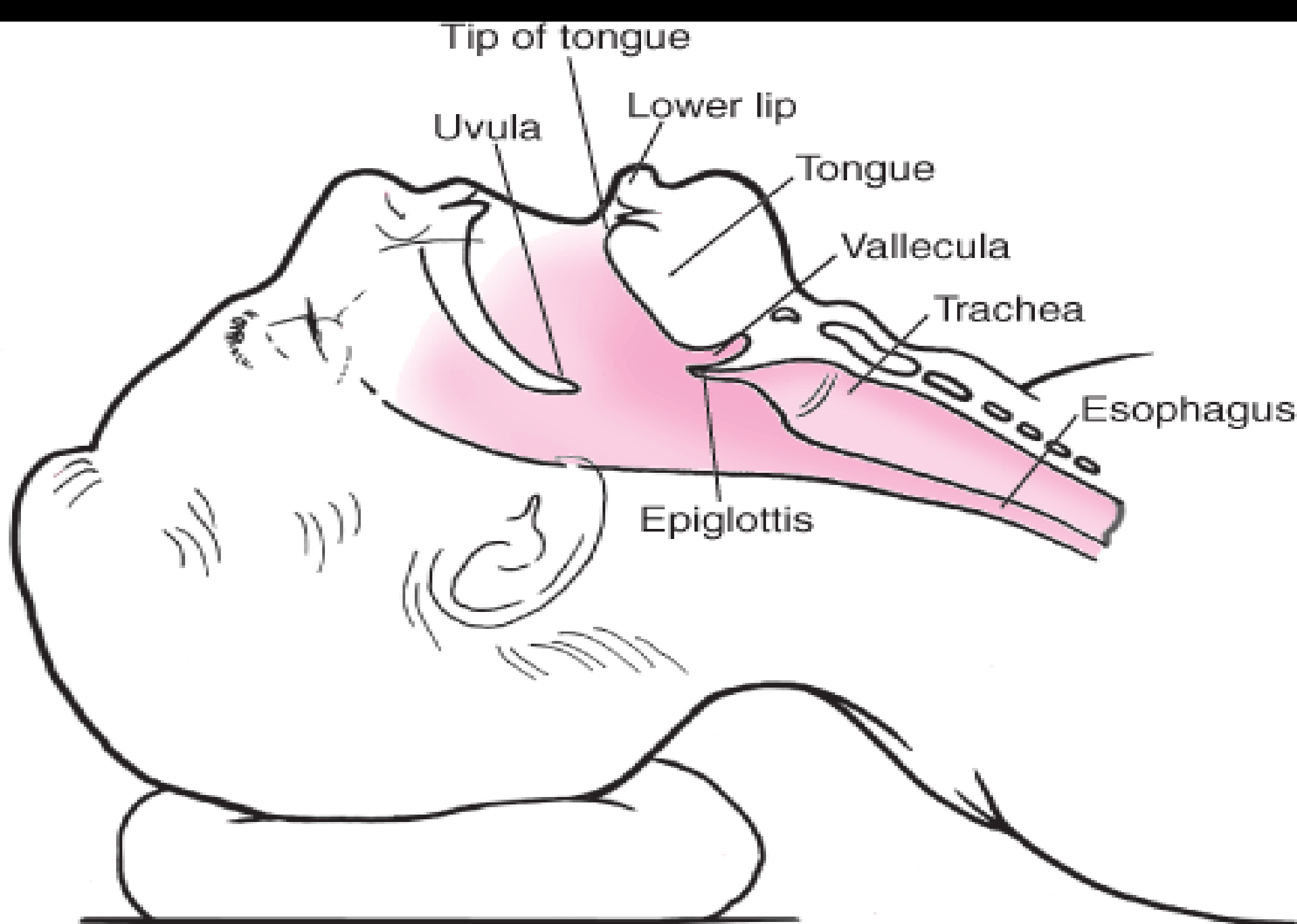
Sellick's Maneuver

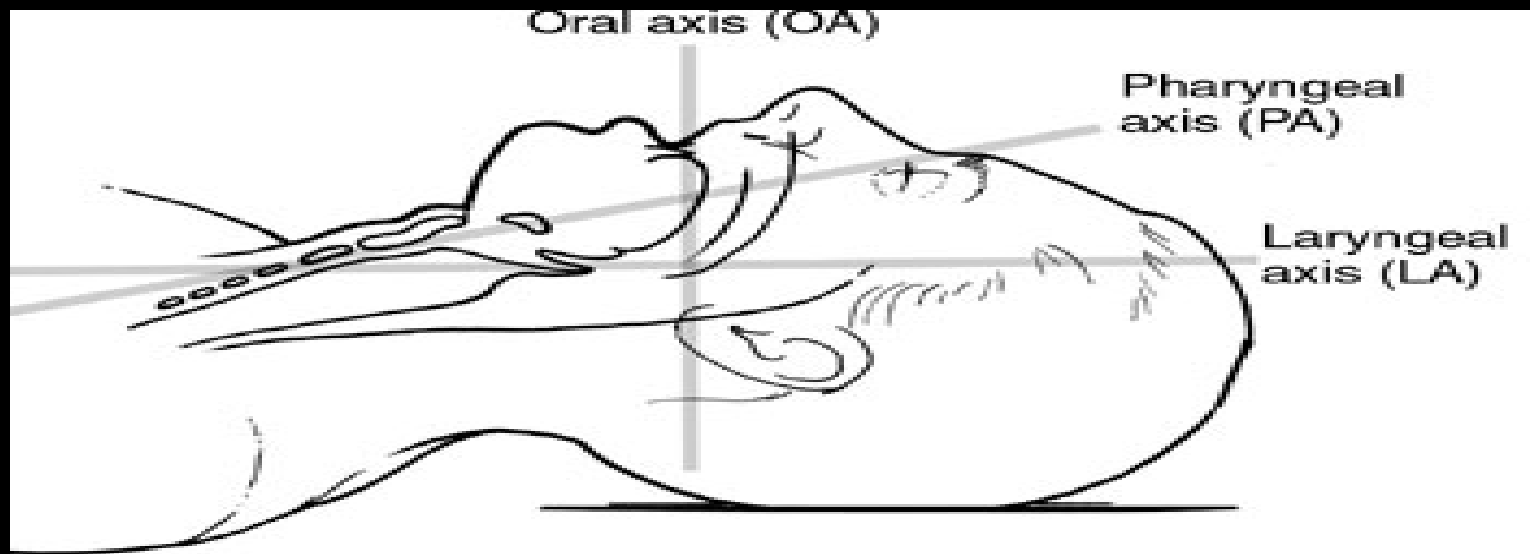


Sample Rapid Sequence Intubation Using Etomidate and Succinylcholine

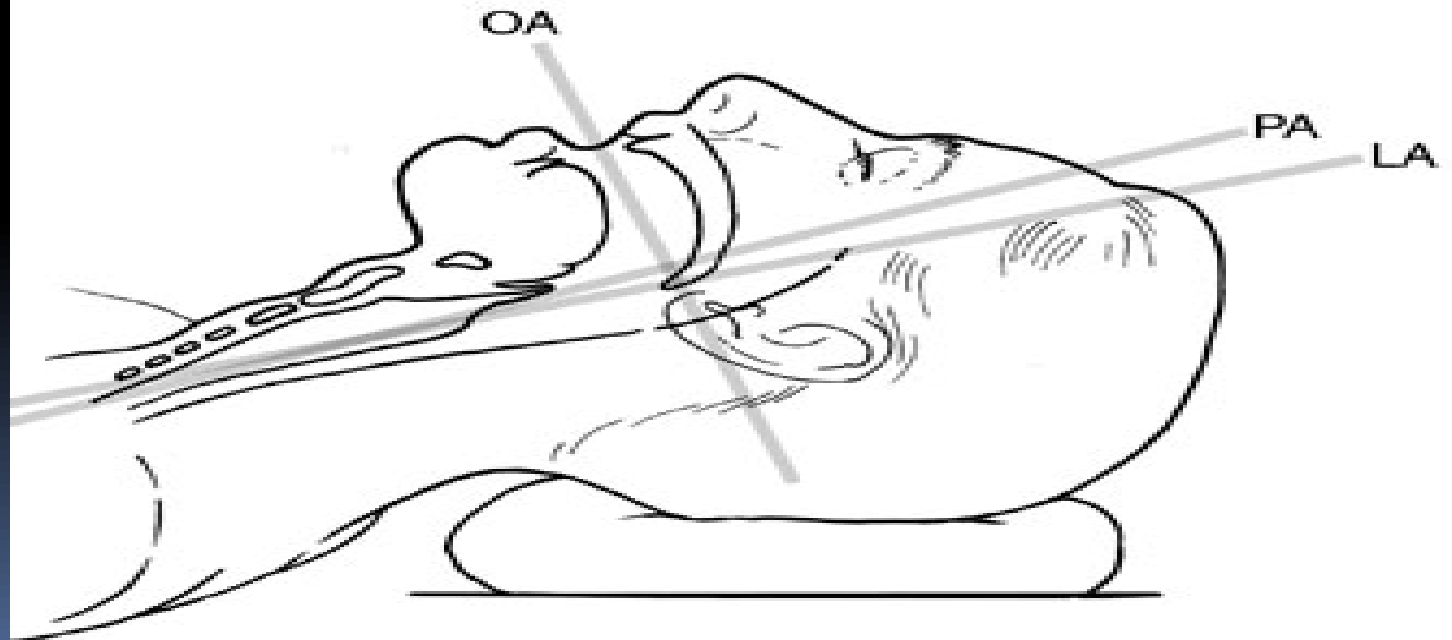
<u>Time</u>	<u>Step</u>	
Zero minus 10 min	Preparation	
Zero minus 5 min	Preoxygenation	100% O ₂ for 3 min or 8 vital capacity breaths
Zero minus 3 min	Pretreatment	As indicated "LOAD"
Zero	Paralysis with induction	Etomidate 0.3 mg/kg Succinylcholine 1.5 mg/kg
Zero plus 45 sec	Placement	Sellick's maneuver Laryngoscopy and intubation
Zero plus 2 min	Post-intubation management	Midazolam 0.1mg/kg plus Pancuronium 0.1mg/kg or Vecuronium 0.1mg/kg



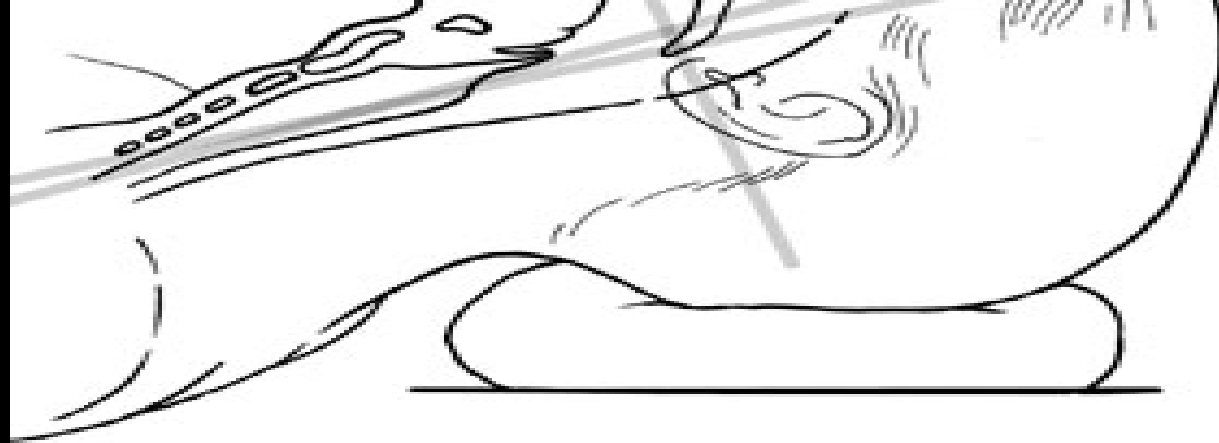




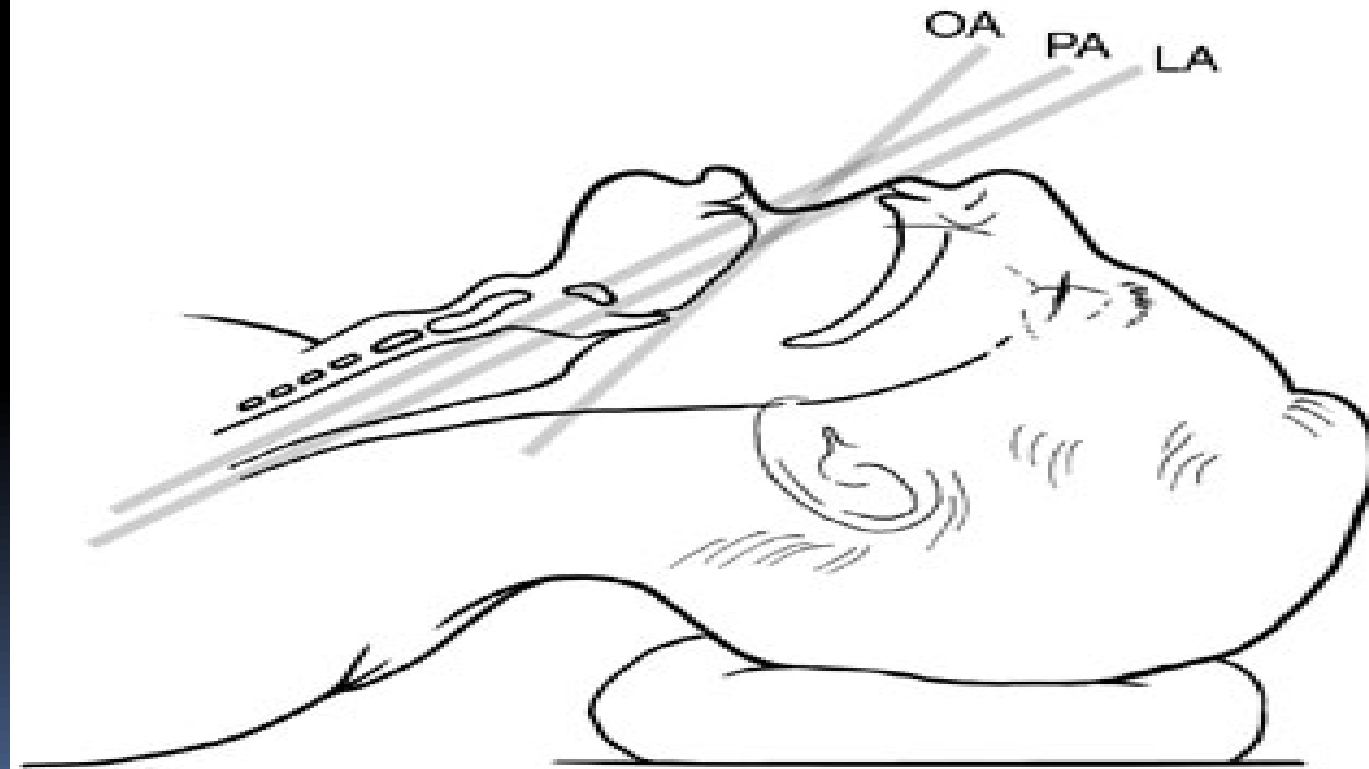
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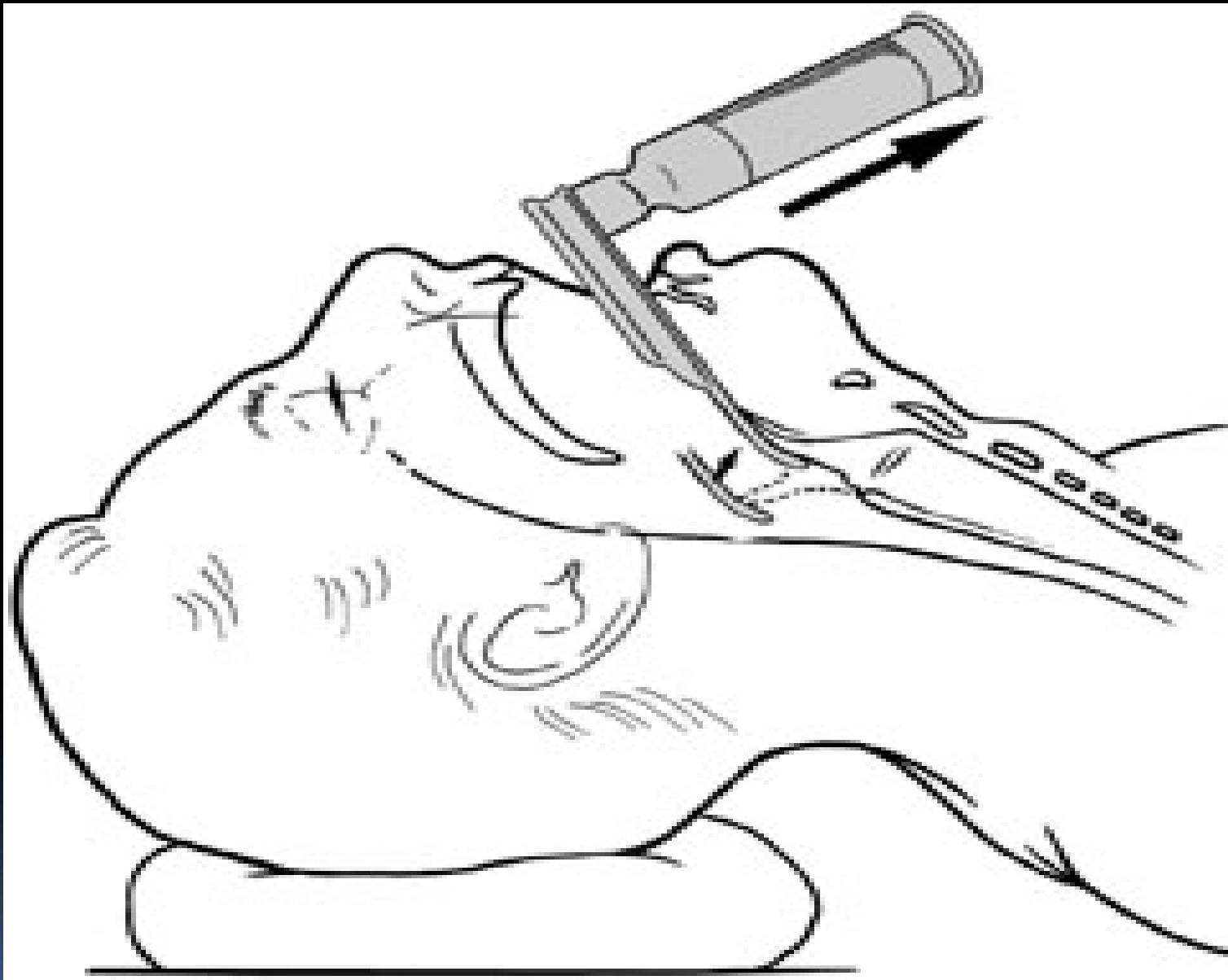
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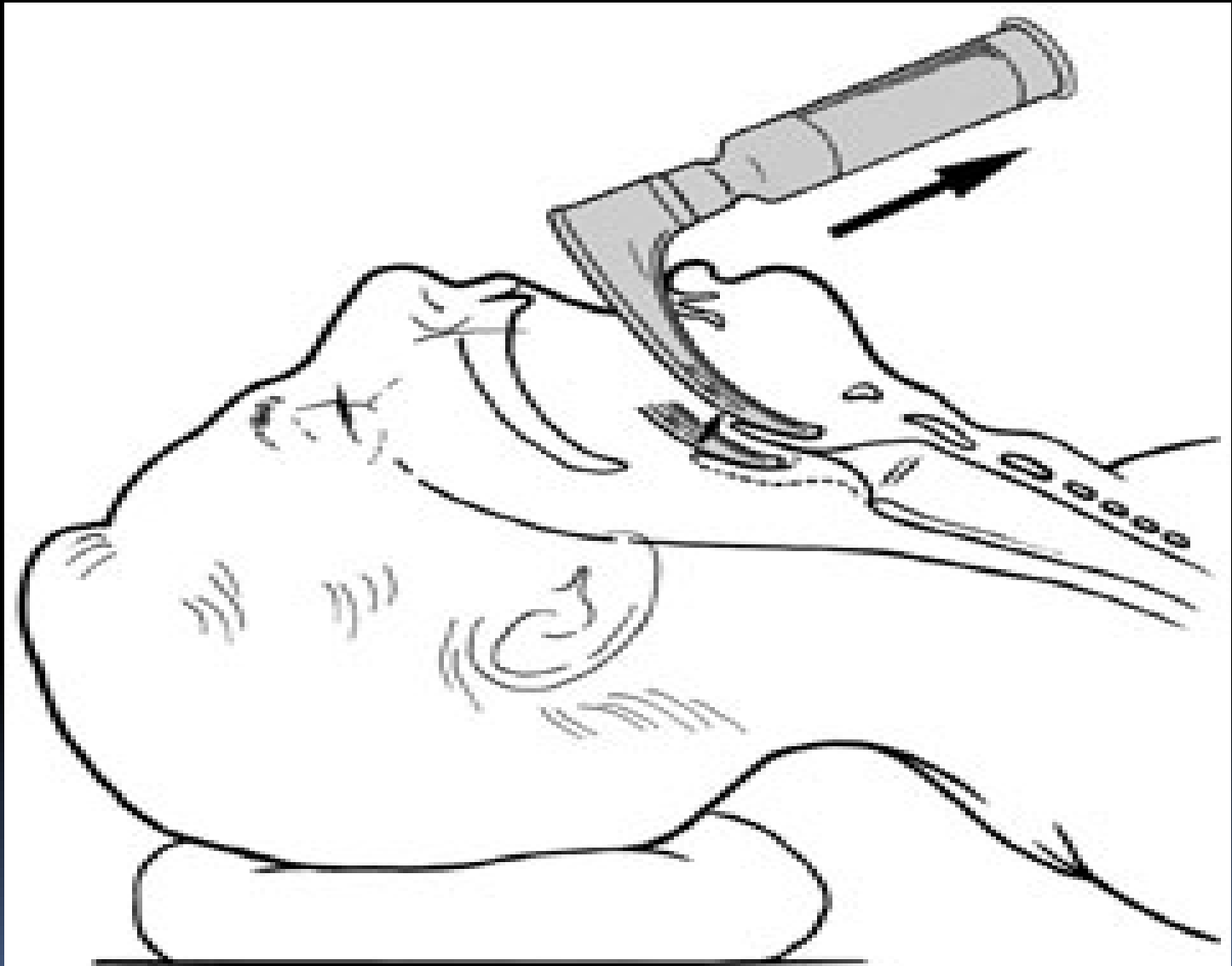


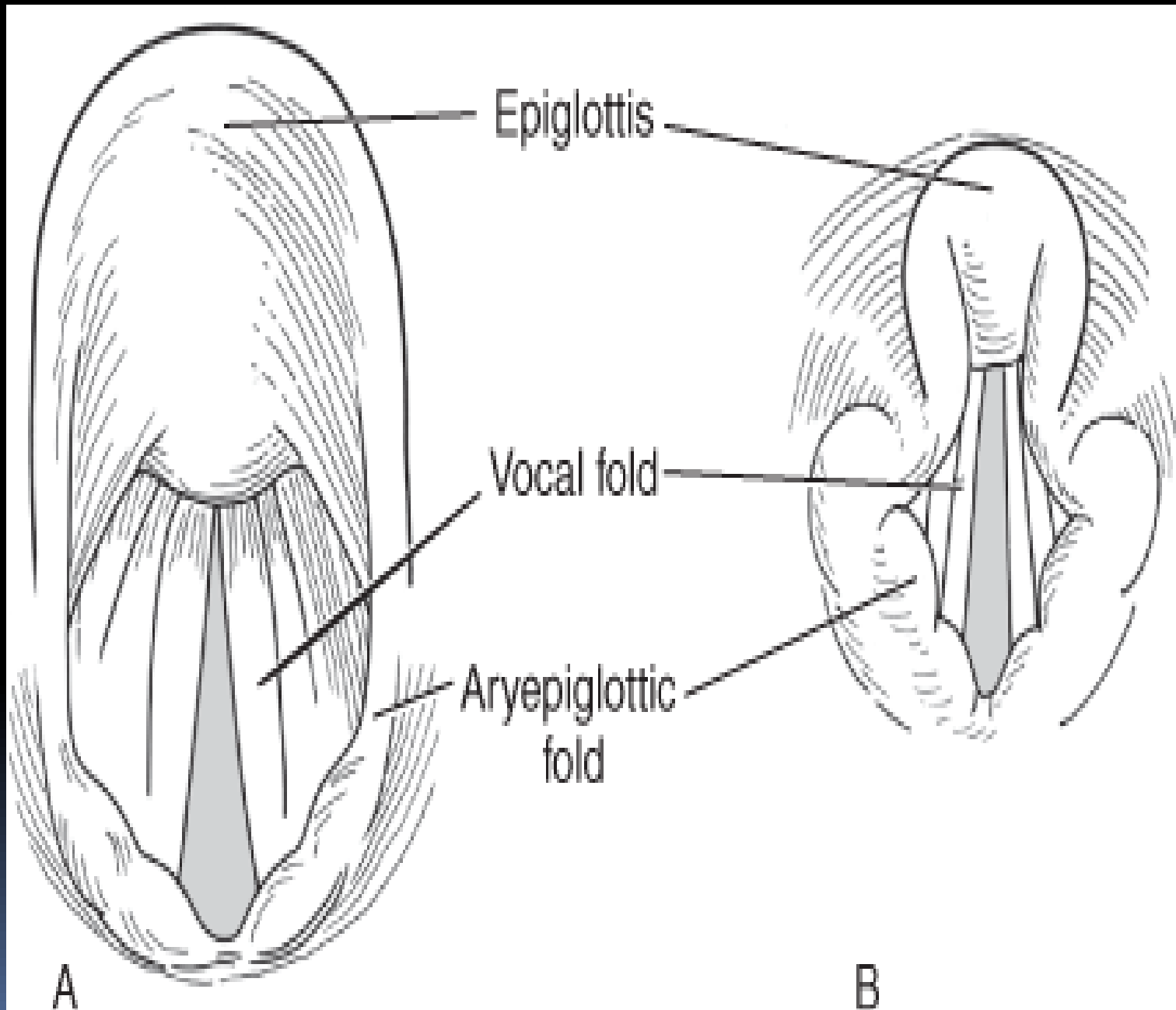
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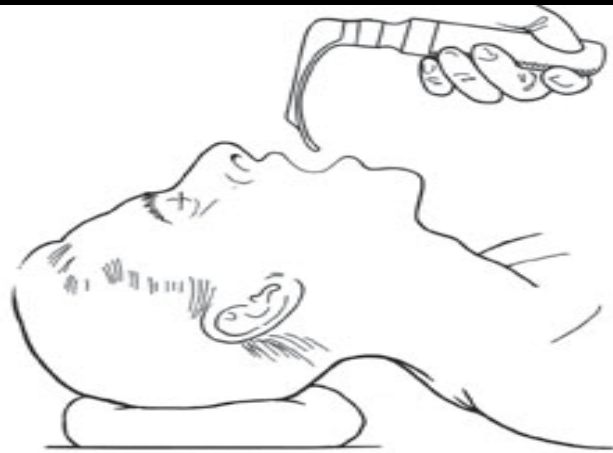


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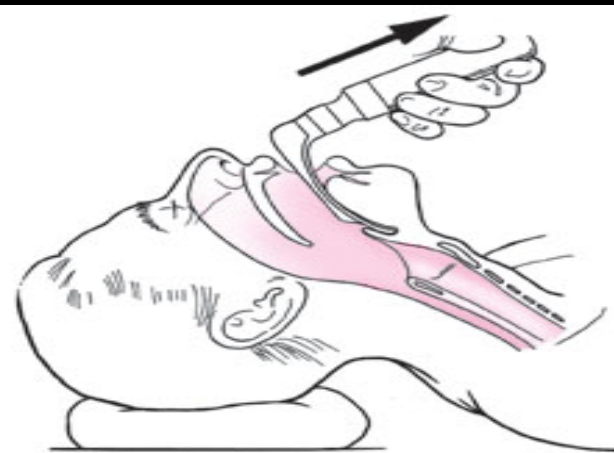




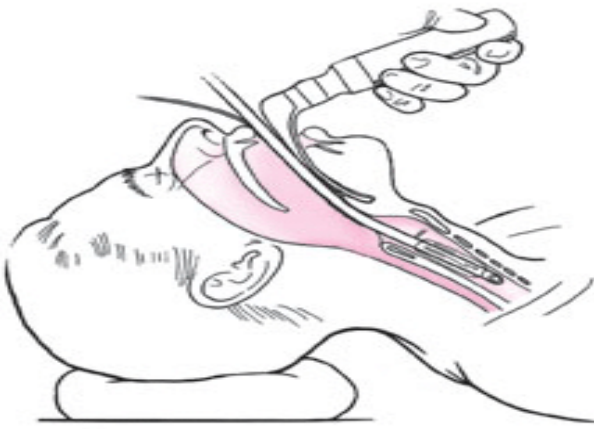




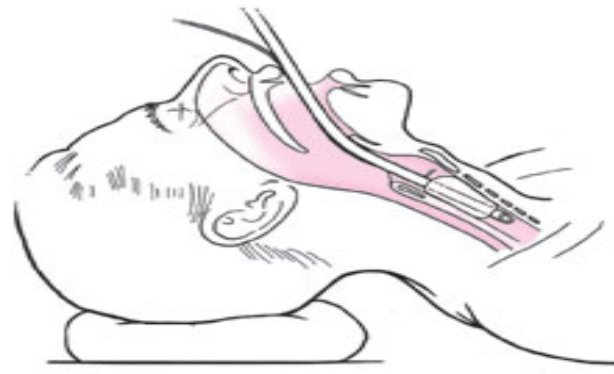
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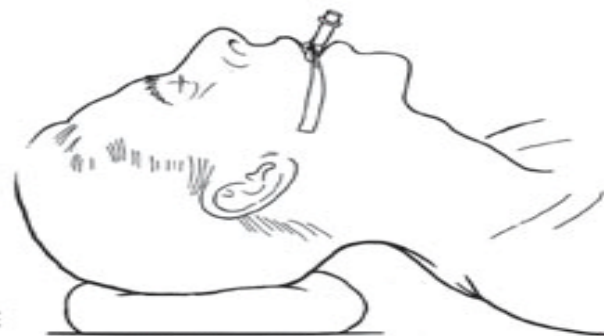
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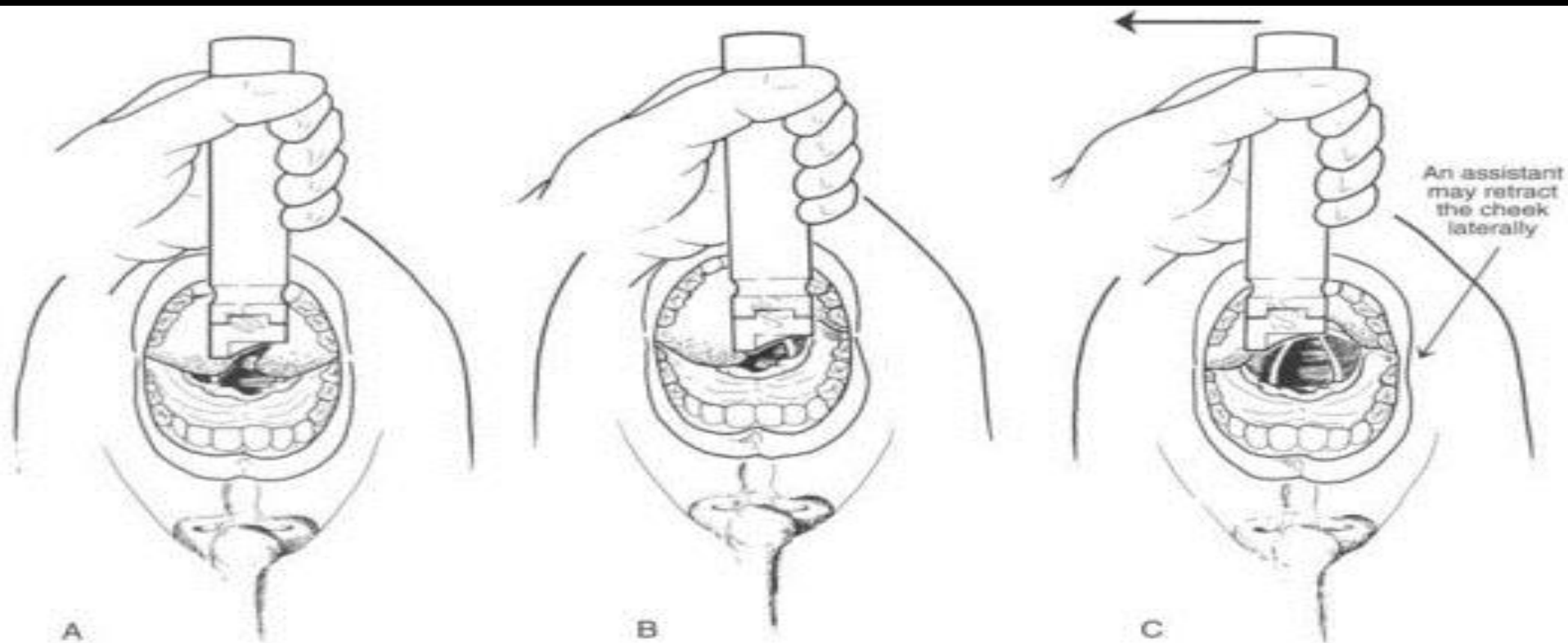


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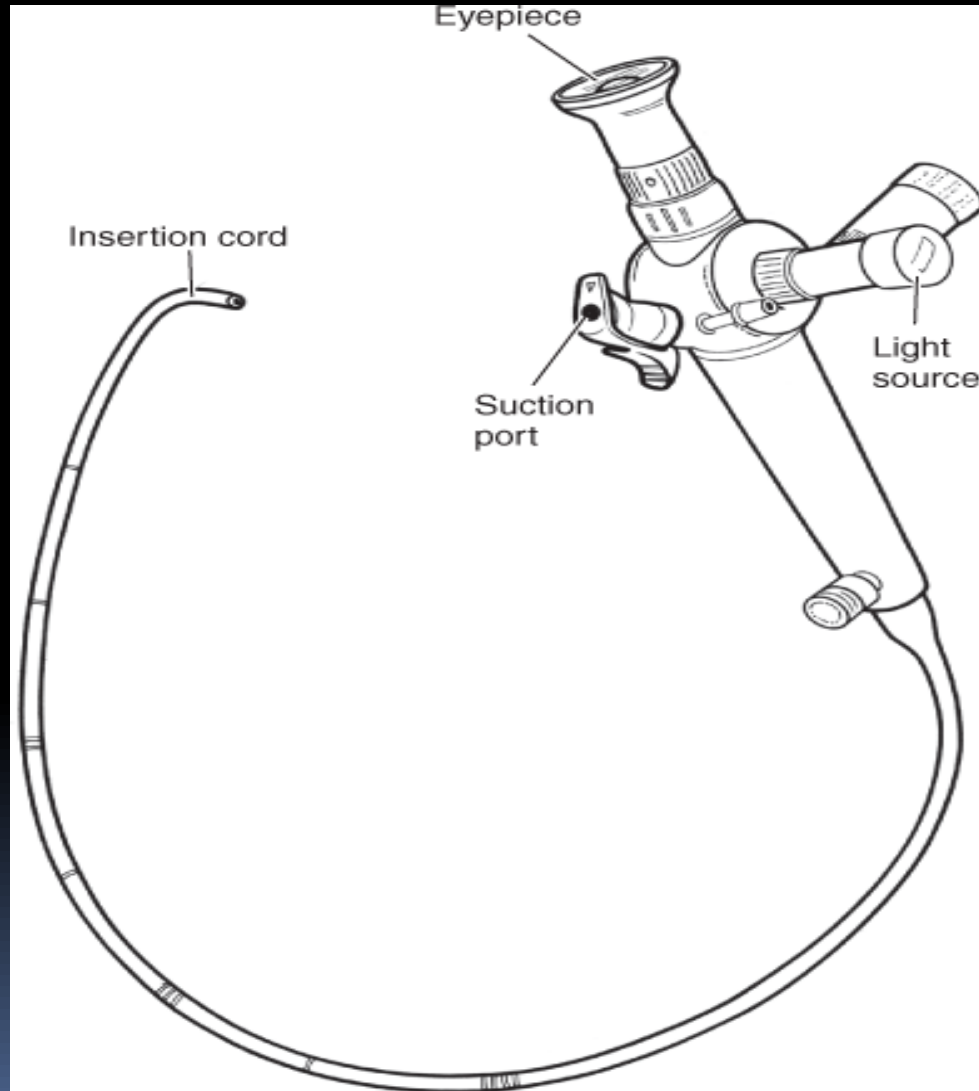
E

Sweep the Tongue/Fish-hook manuever



TRACTION ON LARYNGOSCOPE IS AIMED
TOWARD JUNCTION OF OPPOSITE WALL AND CEILING

Fiberoptic Intubation

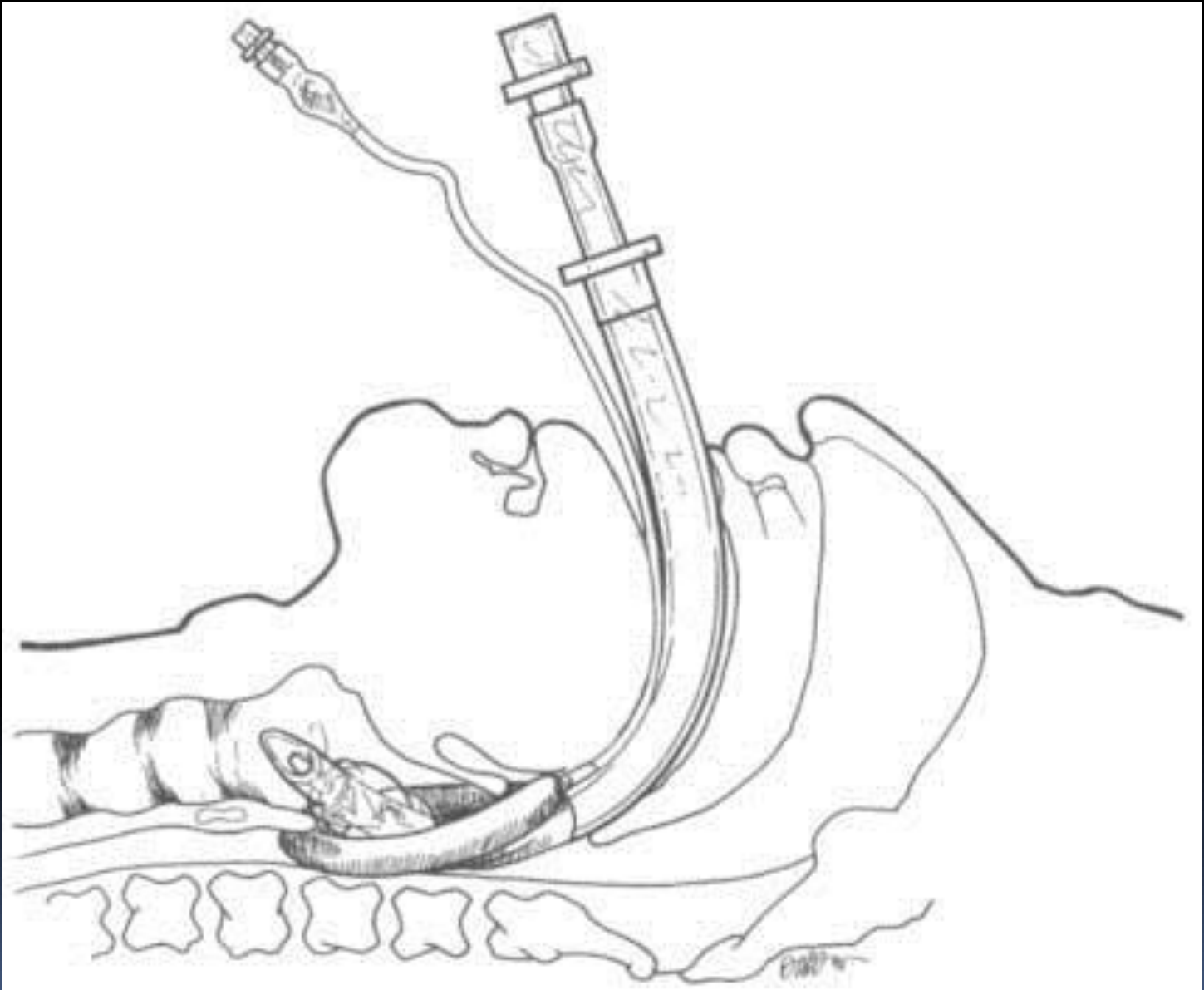


Fiberoptic Intubation

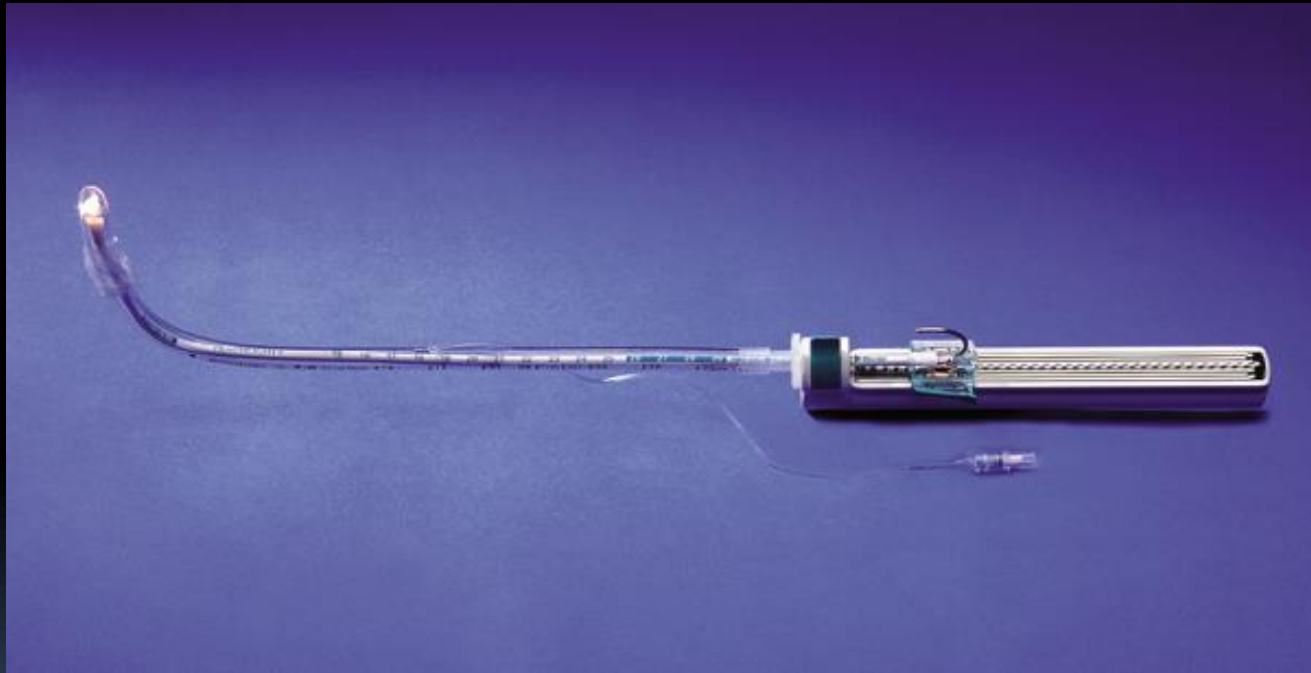


Intubating LMA





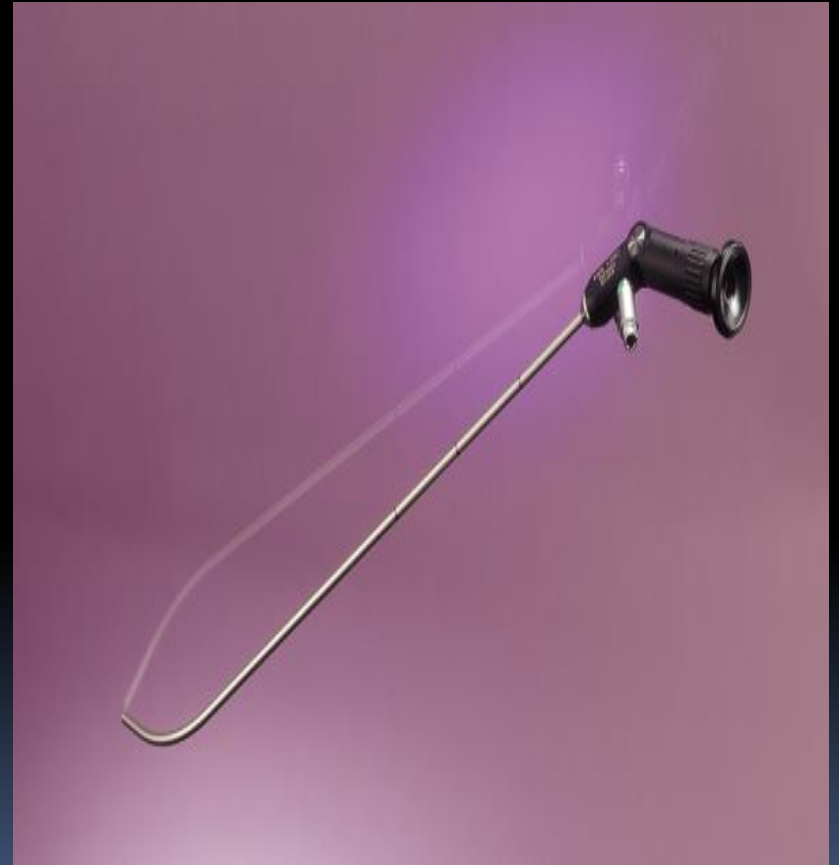
Lighted Stylet



LMA



Optical Stylet



Glide Scope



Cricothyroidotomy

- Cricothyroidotomy has been in use since the early 1900s.
- It is the surgical airway of choice for emergent situations where other methods have failed.
- Any person performing RSI should be able to perform a surgical airway.
- Success rate between 96-100%

Cricothyroidotomy

- Numerous advantages over a tracheostomy.
- Easier, faster & safer.
- Performed in less than 2 minutes.
- Requires little or no surgical training.
- Anatomic landmarks are superficial, easily seen and palpated.
- Does not require deep dissection and can be performed in a neutral position.
- Smaller scar & fewer complications.

Cricothyroidotomy

- Cricothyroid membrane is located between the thyroid cartilage superiorly and the cricoid cartilage inferiorly.
- No significant vascular structures overlying the cricothyroid membrane.

Cricothyroidotomy (Indications)

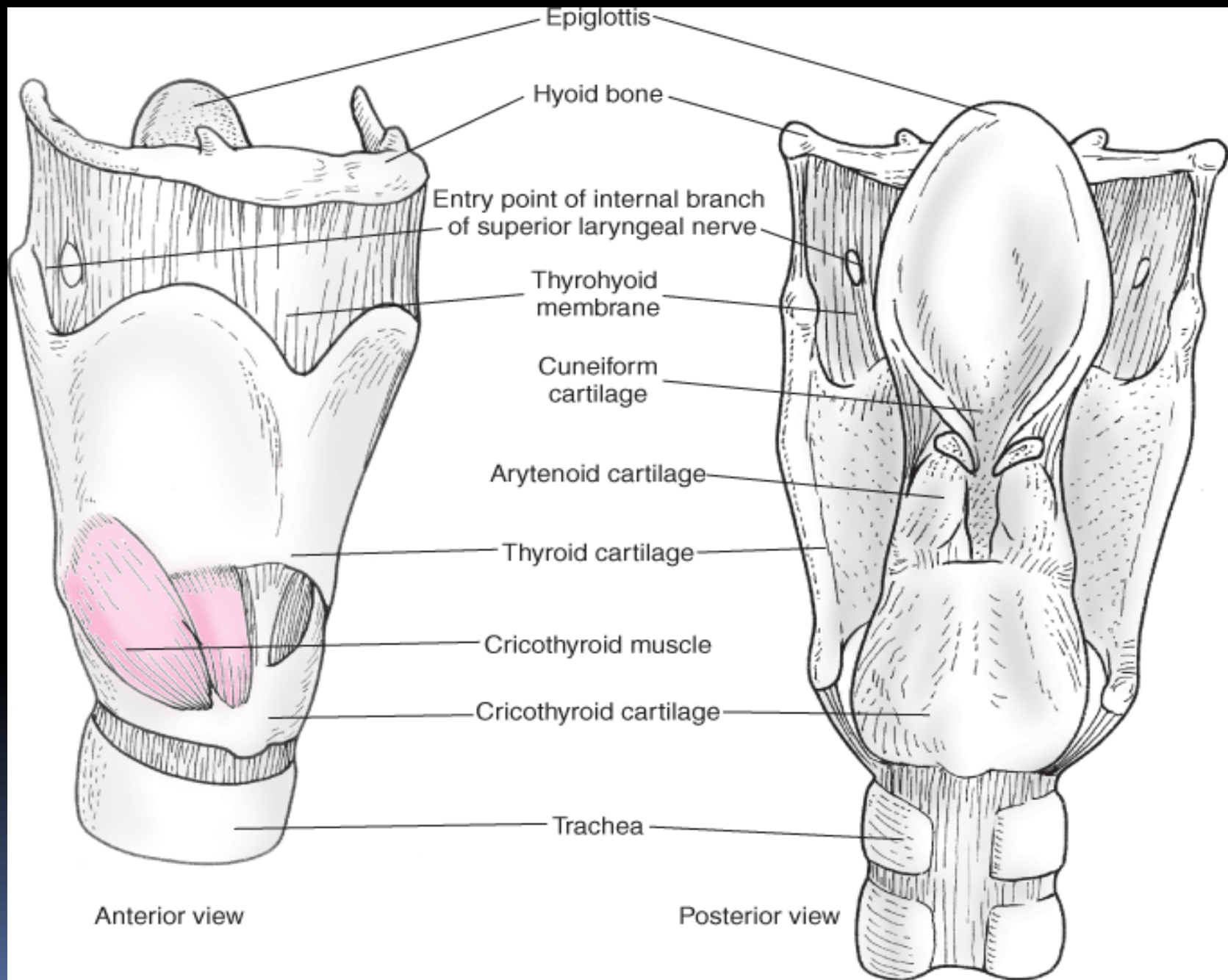
- Inability to intubate endotracheally
- Severe neck or facial injury.
- Edema
- Masseter spasm
- Laryngospasm
- Cervical spine injury
- Anatomic deformities
- Perform needle cricothyroidotomy in children < 8
- 10 y/o

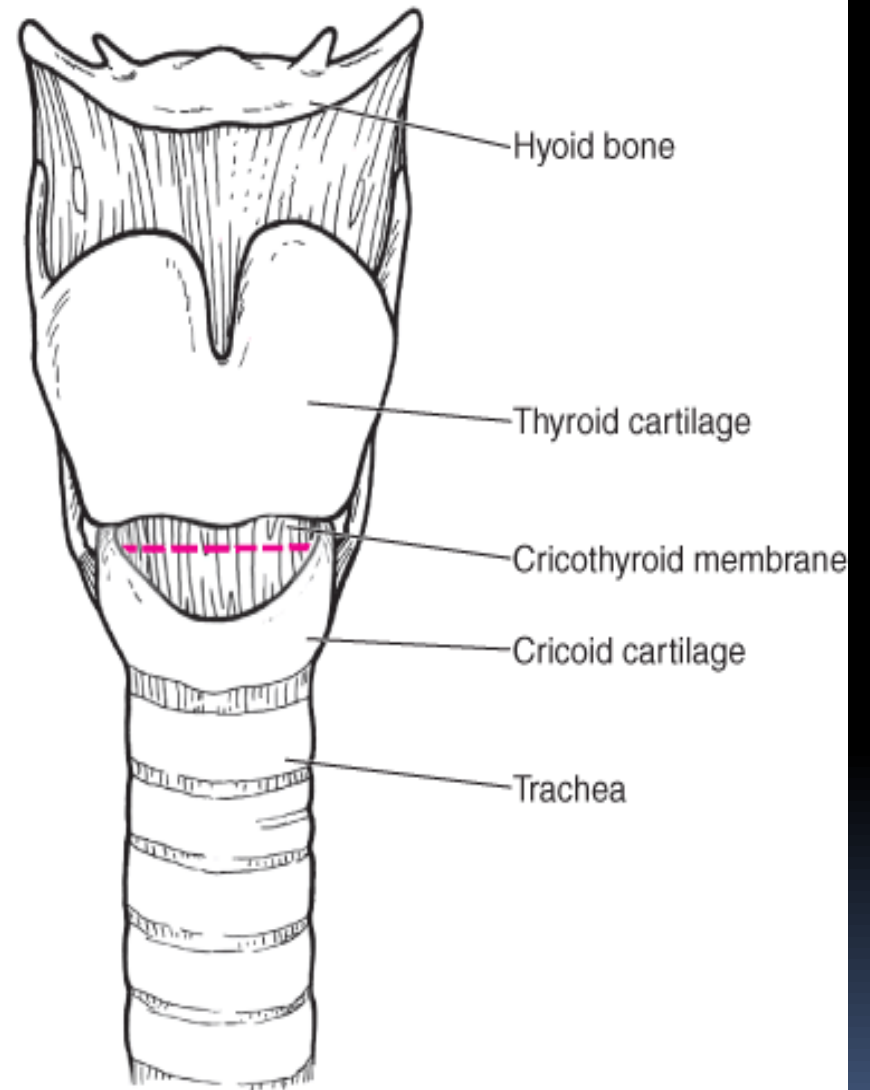
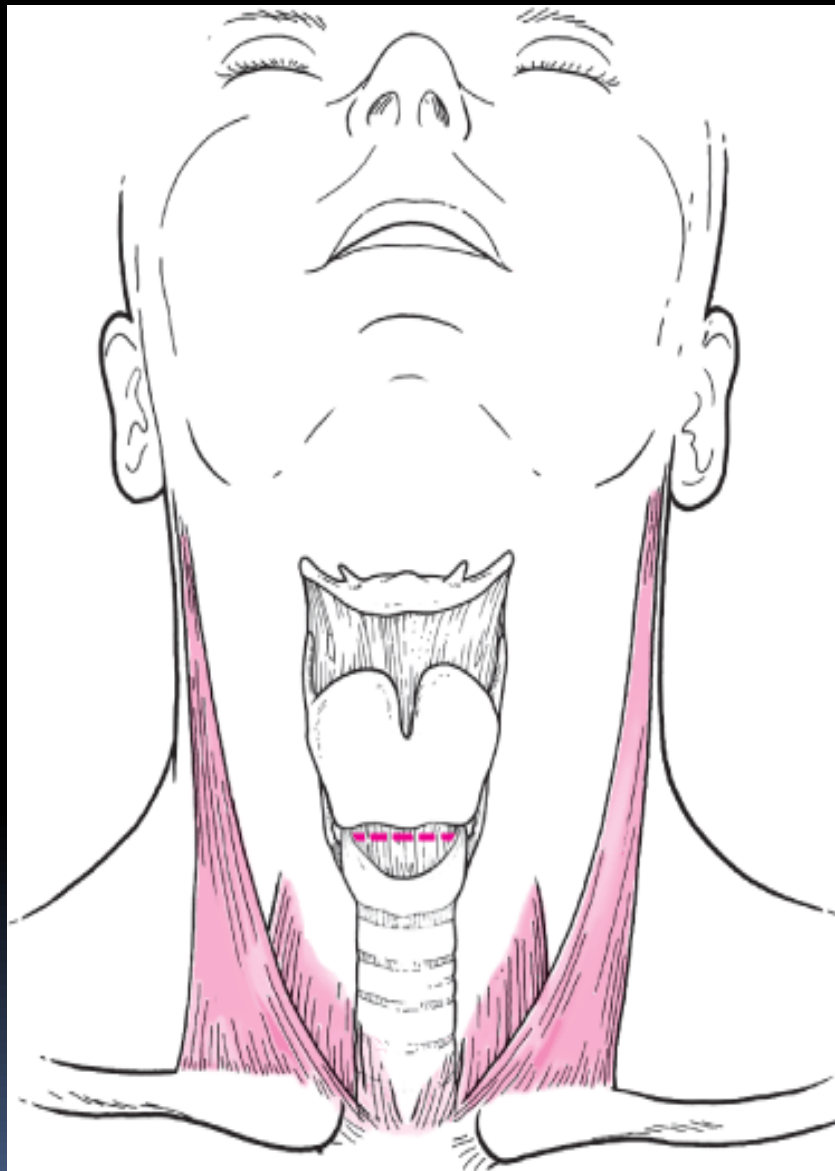
Cricothyroidotomy

- Contraindications
 - Partial or complete transection of the airway
 - Laryngeal pathology
 - Coagulopathy (relative)
 - Massive neck swelling (relative)
 - Neck hematoma

Cricothyroidotomy

- Traditional approach
 - Immobilize the larynx
 - Identify the cricothyroid membrane
 - Skin incision 2-3 cm
 - Stab incision through the membrane
 - Widen the membrane with the scalpel handle
 - Place tube & ventilate

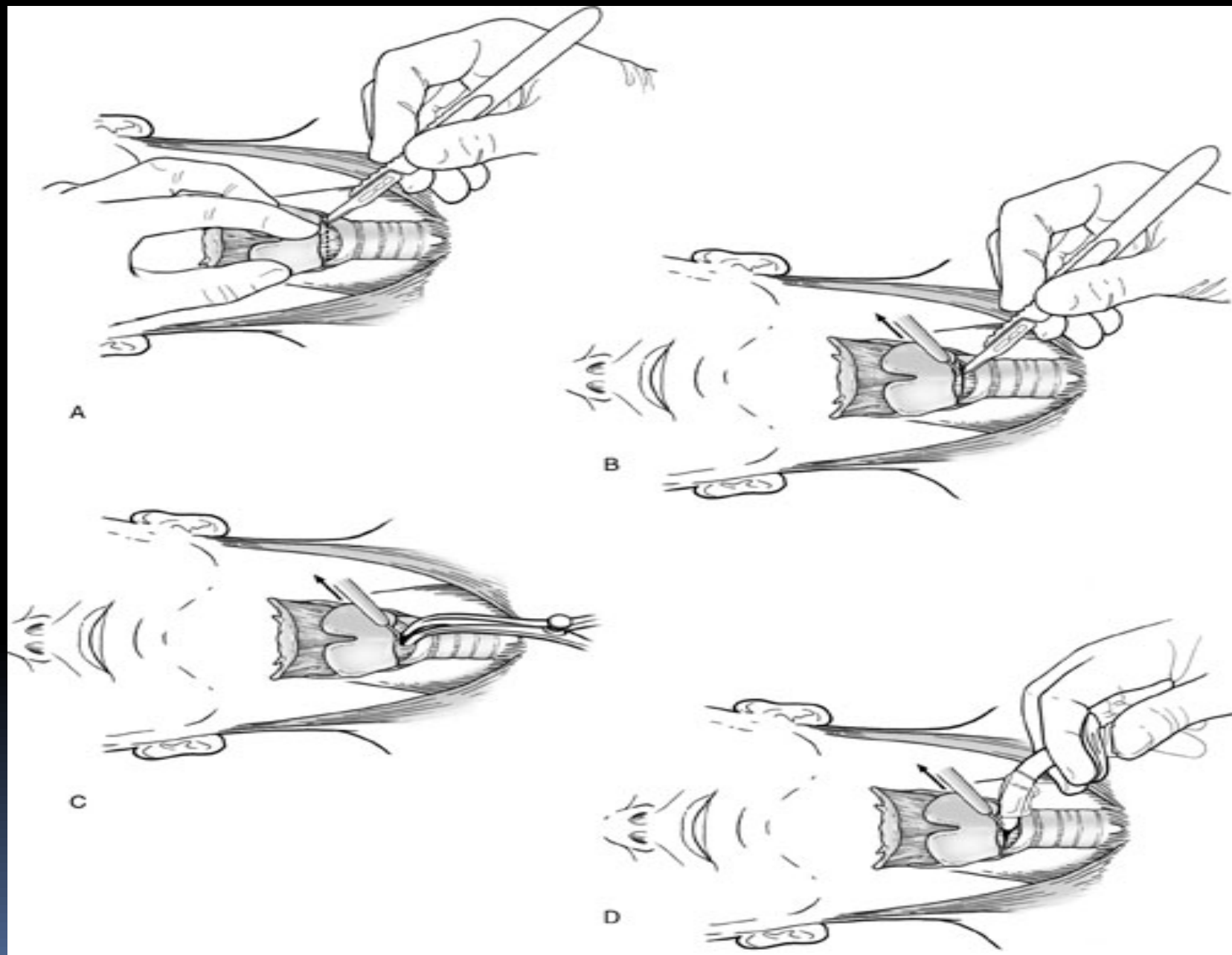






Percutaneous Cricthyroidotomy

- Stab incision through skin only overlying the membrane
- Advance catheter over needle attached to 3ml syringe through the membrane.
- Apply negative pressure to the syringe.
- Bubbles indicate appropriate position.
- Advance catheter until hubbed
- Advance guidewire & remove catheter
- Insert dilator/airway catheter over guidewire, dilate and remove guidewire and dilator while leaving airway catheter in place





Noninvasive Positive Pressure Ventilation (NPPV)

- IPPB- intermittent positive-pressure ventilation
 - Quick burst of pressure support at onset of inspiration
- CPAP – continuous positive airway pressure
- MMV – mask mechanical ventilation
 - Substitute a mask for an ETT
- BL-PAP: bi-level positive airway pressure
 - Both inspiratory pressure (IPAP) and expiratory pressure (EPAP)

BiPAP



- **Pressure-limited** (ie. You set the pressure)
- **Flow triggered** – pts breath starts the machine aided breath (the IPAP)
- IPAP is maintained for 200msec – 3 seconds
- Machine then goes to the EPAP setting
 - Never drops below the EPAP therefore = PEEP

Selection criteria for BiPAP

Yes

- Spontaneously breathing patient
- Patent airway
- Need for assistance of ventilation

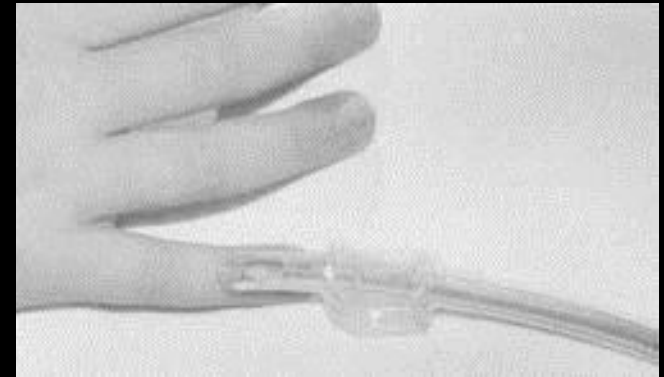
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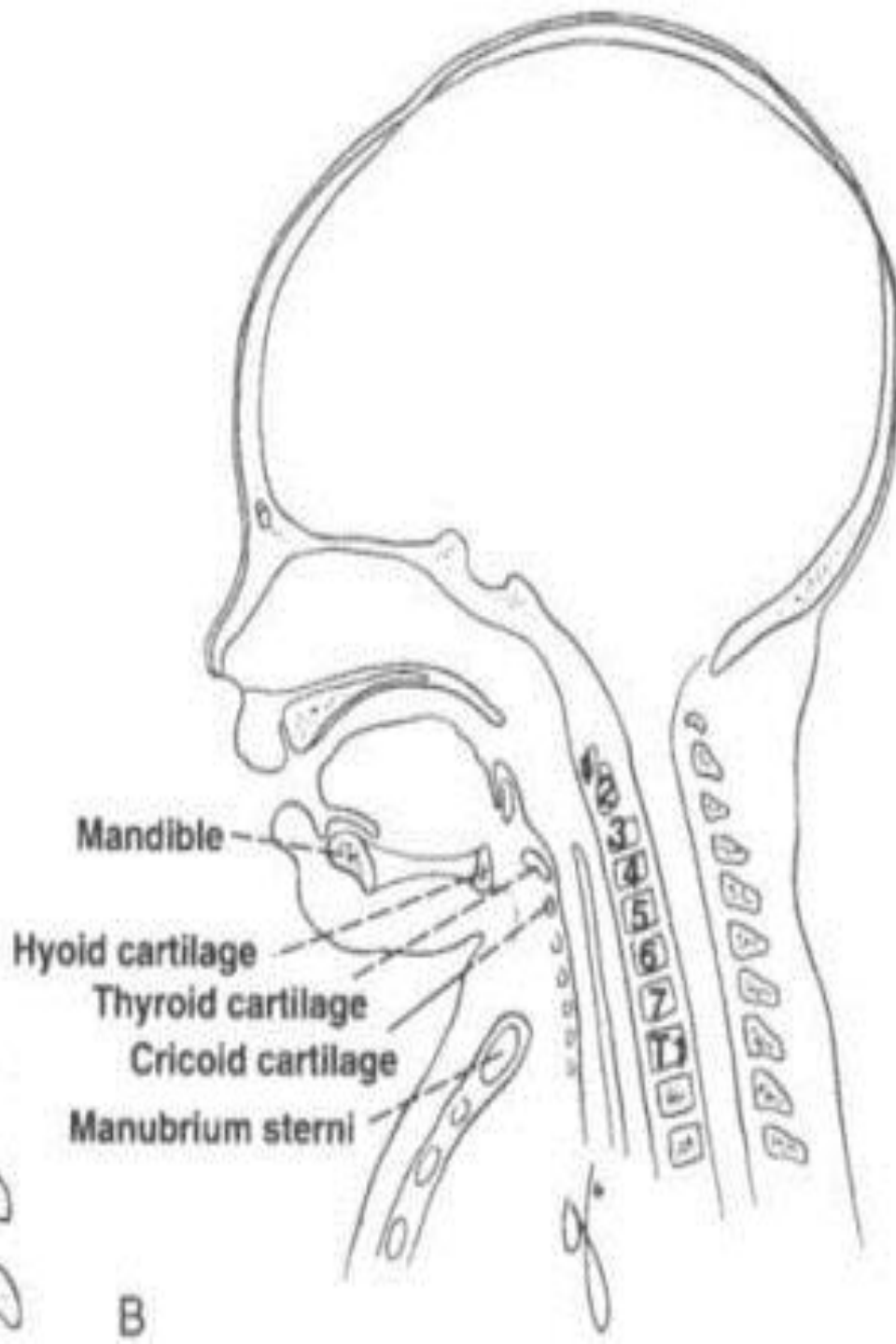
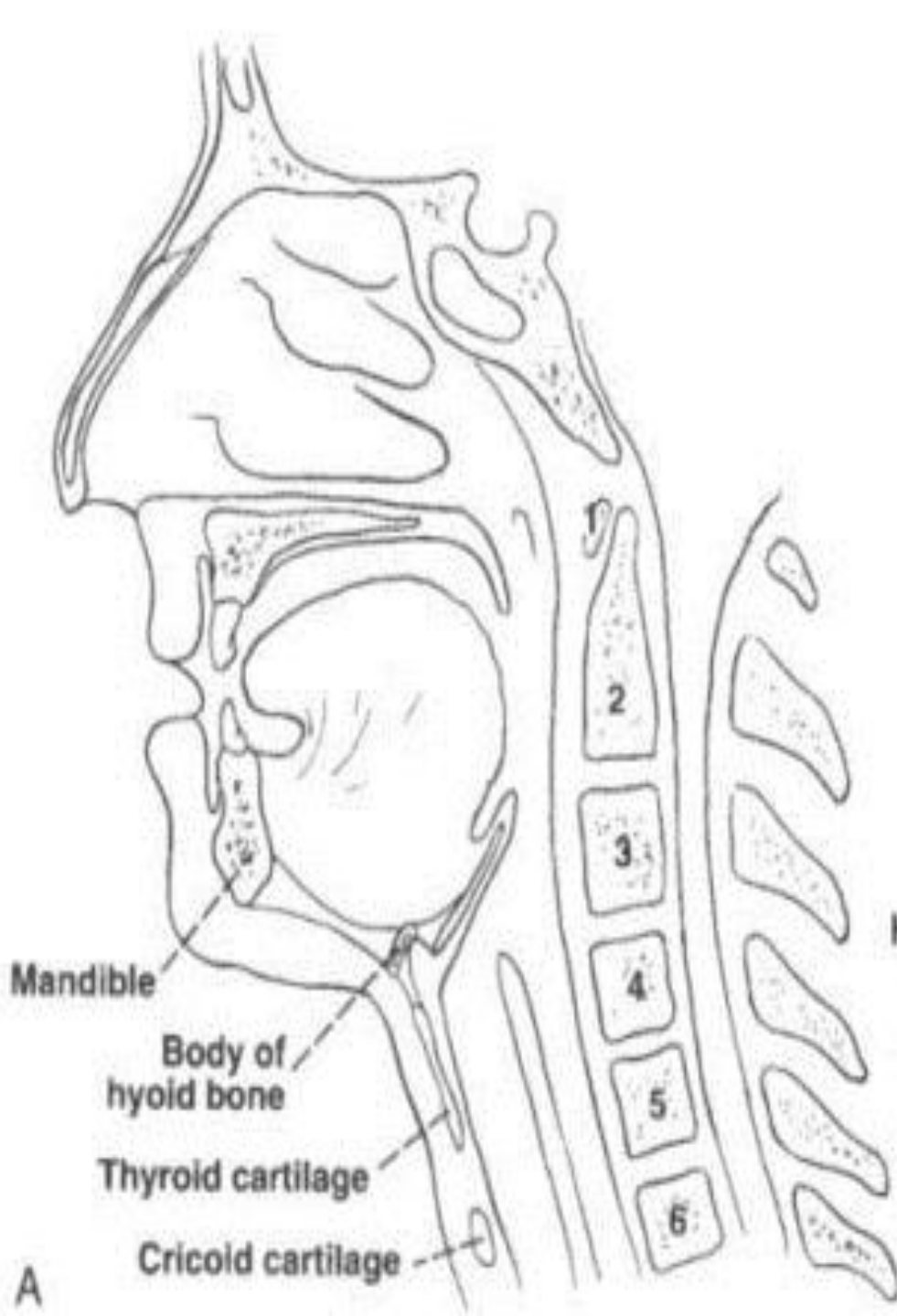
- Inability to maintain a good mask fit
- Unable to tolerate the mask
- Loss of ventilatory drive
- Need for airway protection



Pediatric Airway Pearls

- Tube size = $(\text{Age} + 16)/4$
- Uncuffed tube if <8
 - Don't inflate a cuffed tube
- Miller blades predominate
- Blade size on Braslow tape
- Atropine if using succinylcholine
- Percutaneous Needle Cricothyroidotomy if <10





VENTILATION BAG

STANDARD
ENDOTRACHEAL
TUBE CONNECTOR

3cc
SYRINGE BARREL

CRICOTHYROID
MEMBRANE

14-GAUGE IV
CATHETER-OVER-NEEDLE

THYROID CARTILAGE

CRICOID RING

